

THE ENVIRONMENTAL DISTRIBUTION OF LATE PROTEROZOIC ORGANISMS

A. H. Knoll
Harvard University

Along present day coast lines, the environmental distributions of prokaryotic and protistan populations are often sharply delimited. Realized habitat ranges are generally narrower than those circumscribed by physiological tolerances, suggesting the importance of organism-organism interactions in the determination of population distributions. Microfossil populations preserved in silicified carbonates, dolomites, and shales of the 700-800 Ma old Akademikerbreen Group, Svalbard, and elsewhere indicate that the environmental distributions were defined equally clearly during the Proterozoic Eon. The Draken Conglomerate Formation is a tidal flat/lagoonal complex in which we have distinguished five principle biofacies containing a total of 42 taxa. Supratidal to subtidal gradients include the increasing abundance and diversity of both mat dweller microbenthos and allochthonous (principally planktonic) organisms, as well as a taphonomically important pattern of decreasing sheath thickness among mat builder microorganisms. The seaward barriers of Akademikerbreen lagoons were oolitic shoals, and these contain about a dozen endolithic and epilithic species not observed elsewhere in the group. Subtidal environments below fair weather wave base are represented by mudstones of the Svanbergfjellet Formation. These contain abundant and diverse cyanobacteria-like fossils generally similar to but specifically different from those found in tidal flat sediments, as well as diverse unicellular protists - some of impressive morphological complexity -- and at least half a dozen cellularly preserved metaphyte populations. In all, more than 80 species are distributed among Akademikerbreen lithologies. Fossil assemblages from Svalbard and elsewhere illustrate the potential for a much finer paleoecological, biostratigraphic, and, hence, evolutionary resolution of the early fossil record.